# **TEST REPORT**

 $\overline{\mathbf{T}}$  D+8.C

Dt&C Co., Ltd.

<b>Dt&amp;C</b>	42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042 Tel : 031-321-2664, Fax : 031-321-1664				
1. Report No: DRTFCC2312-0162	2				
2. Customer					
• Name (FCC) : MOTREX CO., LT	D.				
• Address (FCC) : Seoyoung Bldg. Gyeonggi-do,So	25, Hwangsaeul-ro 258beon-gil,Bundang-gu, Seongnam-si, buth Korea				
3. Use of Report : FCC Original Gra	int				
4. Product Name / Model Name : SM FCC ID : BP9-MH300LK01	MART DISPLAY / MH300L-K01				
5. FCC Regulation(s): Part 15.247 Test Method used: KDB558074 D	001v05r02, ANSI C63.10-2013				
6. Date of Test : 2023.10.10 ~ 2023.	.12.08				
7. Location of Test : 🛛 Permanent	Testing Lab On Site Testing				
8. Testing Environment : See appen	ded test report.				
9. Test Result : Refer to the attached	d test result.				
The results shown in this test report refe This test report is not related to KOLAS	er only to the sample(s) tested unless otherwise stated. accreditation.				
Affirmation Tested by	Technical Manager				
Name : JaeHyeok Bang	Name : JaeJin Lee (Signature)				
	2023 . 12 . 08 .				
	Dt&C Co., Ltd.				

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

# **Test Report Version**

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2312-0162	Dec. 08, 2023	Initial issue	JaeHyeok Bang	JaeJin Lee



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# **1. General Information**

# 1.1. Description of EUT

Equipment Class	Part 15 Spread Spectrum Transmitter (DSS)	
Product Name	SMART DISPLAY	
Model Name	MH300L-K01	
Add Model Name	-	
Firmware Version Identification Number	Rev 0.1	
EUT Serial Number	No Specified	
Power Supply	DC 12 V	
Frequency Range	2 402 MHz ~ 2 480 MHz	
Max. RF Output Power	-0.87 dBm (0.0008 W)	
Modulation Technique (Data rate)	GFSK(1 Mbps), π/4DQPSK(2 Mbps), 8DPSK(3 Mbps)	
Number of Channels	79	
Antenna Specification	Antenna Type: Chip Antenna Gain: 0.95 dBi (PK)	

# **1.2. Declaration by the applicant / manufacturer**

- NA

### 1.3. Testing Laboratory

#### Dt&C Co., Ltd.

The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.

The test site complies with the requirements of Part 2.948 according to ANSI C63.4-2014.

#### - FCC & IC MRA Designation No. : KR0034

#### - ISED#: 5740A

www.dtnc.net		
Telephone	:	+ 82-31-321-2664
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### **1.4. Testing Environment**

Ambient Condition	
Temperature	+21 °C ~ +24 °C
<ul> <li>Relative Humidity</li> </ul>	40 % ~ 43 %

#### **1.5. Measurement Uncertainty**

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C63.4-2014 and ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence.

Parameter	Measurement uncertainty
Antenna-port conducted emission	1.0 dB (The confidence level is about 95 %, $k = 2$ )
Radiated emission (1 GHz Below)	4.8 dB (The confidence level is about 95 %, $k = 2$ )
Radiated emission (1 GHz ~ 18 GHz)	4.8 dB (The confidence level is about 95 %, $k = 2$ )
Radiated emission (18 GHz Above)	4.9 dB (The confidence level is about 95 %, k = 2)

### 1.6. Information about the FHSS characteristics

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following :
  - A) The hopping sequence is pseudorandom
    - Note 1 : Pseudorandom Frequency Hopping Sequence Table as below:
      - Channel: 08, 24, 40, 56, 42, 54, 72, 09, 01, 11, 33, 41, 34, 42, 65, 73, 53, 69, 06, 22, 04, 20, 36, 52, 38, 46, 70, 78, 68, 76, 21, 29, 10, 26, 41, 58, 44, 60, 76, 13, 03, 11, 35, 43, 37, 45, 69, 77, 52, 71, 08, 24, 06, 24, 48, 56, 45, 46, 70, 01, 72, 06, 25, 33, 12, 28, 49, 60, 45, 58, 74, 13, 05, 18, 37, 49 etc

The System receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchroniztation with the transmit ted signals.

- B) All channels are used equally on average
- C) The receiver input bandwidth equals the transmit bandwidth
- D) The receiver hops in sequenc e with the transmit signal
- 15.247(g) : In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
- 15.247(h) : In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection / hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.
- 15.247(h) : The EUT employs Adaptive Frequency Hopping (AFH) which identifies sources of interference namely devices operating in 802.11 WLAN and excludes them from the list of available channels. The process of re-mapping reduces the number of test channels from 79 channels to a minimum number of 20 channels.

### 1.7. Conclusion of worst-case and operation mode

The EUT has three types of modulation (GFSK,  $\pi$ /4DQPSK and 8DPSK). Therefore all applicable requirements were tested with all the modulations. And packet type was tested at the worst case(DH5).

#### EUT Operation test setup

Bluetooth tester was used to control the transmit parameters during test.

#### Tested frequency information,

- Hopping Function : Enable

	Tested Frequency (MHz)		
Hopping Band	2 402 ~ 2 480		

- Hopping Function : Disable

	Tested Frequency (MHz)		
Lowest Channel	2 402		
Middle Channel	2 441		
Highest Channel	2 480		



# 1.8. Test Equipment List

Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	23/06/23	24/06/23	MY46471622
Spectrum Analyzer	Agilent Technologies	N9020A	22/12/16	23/12/16	MY48011700
Spectrum Analyzer	Agilent Technologies	N9020A	23/06/23	24/06/23	US47360812
Receiver	Rohde Schwarz	ESCI3	23/06/23	24/06/23	100798
DC Power Supply	Agilent Technologies	66332A	23/06/23	24/06/23	US37474125
DC Power Supply	SM techno	SDP30-5D	23/06/23	24/06/23	305DMG288
Multimeter	FLUKE	17B+	22/12/16	23/12/16	36390701WS
BlueTooth Tester	TESCOM	TC-3000C	23/06/23	24/06/23	3000C000563
Power Splitter	Anritsu	K241B	23/06/23	24/06/23	020611
Signal Generator	Rohde Schwarz	SMBV100A	22/12/16	23/12/16	255571
Signal Generator	ANRITSU	MG3695C	22/12/16	23/12/16	173501
Thermohygrometer	BODYCOM	BJ5478	22/12/16	23/12/16	120612-1
Thermohygrometer	BODYCOM	BJ5478	22/12/16	23/12/16	120612-2
Thermohygrometer	BODYCOM	BJ5478	23/06/23	24/06/23	N/A
Loop Antenna	ETS-Lindgren	6502	22/04/22	24/04/22	00203480
Hybrid Antenna	Schwarzbeck	VULB 9160	22/12/16	23/12/16	3362
Horn Antenna	ETS-Lindgren	3117	23/06/23	24/06/23	00143278
Horn Antenna	A.H.Systems Inc.	SAS-574	23/06/23	24/06/23	155
PreAmplifier	tsj	MLA-0118-B01-40	22/12/16	23/12/16	1852267
PreAmplifier	tsj	MLA-1840-J02-45	23/06/23	24/06/23	16966-10728
PreAmplifier	H.P	8447D	22/12/16	23/12/16	2944A07774
High Pass Filter	Wainwright Instruments	WHKX12-935-1000- 15000-40SS	23/06/23	24/06/23	8
High Pass Filter	Wainwright Instruments	WHKX10-2838-3300- 18000-60SS	23/06/23	24/06/23	1
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5-6SS	23/06/23	24/06/23	3
Attenuator	Hefei Shunze	SS5T2.92-10-40	23/06/23	24/06/23	16012202
Attenuator	Aeroflex/Weinschel	56-3	23/06/23	24/06/23	Y2370
Attenuator	SMAJK	SMAJK-2-3	23/06/23	24/06/23	3
Attenuator	SMAJK	SMAJK-2-3	23/06/23	24/06/23	2
Attenuator	Aeroflex/Weinschel	86-10-11	23/06/23	24/06/23	408
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2496A MA2411B	22/12/16	23/12/16	1338004 1911481
Cable	Dt&C	Cable	23/01/04	24/01/04	G-2
Cable	HUBER+SUHNER	SUCOFLEX 100	23/01/04	24/01/04	G-3
Cable	Dt&C	Cable	23/01/04	24/01/04	G-4
Cable	OMT	YSS21S	23/01/04	24/01/04	G-5
Cable	Junkosha	MWX241	23/01/03	24/01/03	mmW-1
Cable	Junkosha	MWX241	23/01/03	24/01/03	mmW-4
Cable	HUBER+SUHNER	SUCOFLEX100	23/01/04	24/01/04	M-01
Cable	HUBER+SUHNER	SUCOFLEX100	23/01/04	24/01/04	M-02
Cable	JUNKOSHA	MWX241/B	23/01/04	24/01/04	M-03
Cable	JUNKOSHA	J12J101757-00	23/01/04	24/01/04	M-07
Cable	HUBER+SUHNER	SUCOFLEX106	23/01/04	24/01/04	M-09
Cable	Radiall	TESTPRO3	23/01/04	24/01/04	RFC-70
Test Software (Radiated)	tsj	EMI Measurement	NA	NA	Version 2.00.0185

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017 Note2: The cable is not a regular calibration item, so it has been calibrated by Dt&C itself.



# 2. Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions.

**Conclusion:** Comply

The antenna is permanently attached on the device. Therefore this E.U.T complies with the requirement of Part 15.203

# 3. Summary of Test Results

FCC part section(s)	Test Description	Limit (Using in 2 400 ~ 2 483.5 MHz)	Test Condition	Status Note 1
15.247(a) 15.247(b)	Maximum Peak Conducted Output Power	=< 0.125 W(conducted)		с
	20 dB Bandwidth	NA	-	С
15.247(a)	Carrier Frequency Separation	>= 25 kHz or >= Two thirds of the 20 dB BW, whichever is greater.	Conducted	с
15.247(a)	Number of Hopping Channels	>= 15 hops		С
	Time of Occupancy	=< 0.4 seconds		С
15.247(d)	Unwanted Emissions (Conducted)	The radiated emission to any 100 kHz of out-band shall be at least 20 dB below the highest in-band spectral density.		с
15.247(d) 15.205 15.209	Unwanted Emissions (Radiated)	Part 15.209 Limits (Refer to section 9)	Radiated	С
15.207	AC Power-Line Conducted Emissions	Part 15.207 Limits (Refer to section 10)	AC Line Conducted	NA Note3
15.203	Antenna Requirement	Part 15.203 (Refer to section 2)	-	С

Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.

Note 3: This device is installed in a car. Therefore the power source is a battery of car.



# 4. Maximum Peak Conducted Output Power

### 4.1. Test Setup

Refer to the APPENDIX I.

# 4.2. Limit

#### FCC Requirements

The maximum peak output power of the intentional radiator shall not exceed the following :

- 1. §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2 400 MHz 2 483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
- 2. §15.247(b)(1), For frequency hopping systems operating in the 2 400 2 483.5 MHz employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5 725 MHz 5 805 MHz band : 1 Watt. For all other frequency hopping systems in the 2 400 MHz 2 483.5 MHz band: 0.125 watts.

# 4.3. Test Procedure

- 1. The RF output power was measured with a spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A spectrum analyzer was used to record the shape of the transmit signal.
- 2. The peak output power of the fundamental frequency was measured with the spectrum analyzer using ; Span = approximately 5 times of the 20 dB bandwidth, centered on a hopping channel RBW ≥ 20 dB BW VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold

# 4.4. Test Results

Modulation	Tested Channel	Burst Average Output Power		Peak Output Power	
		dBm	mW	dBm	mW
	Lowest	-1.44	0.72	-1.43	0.72
<u>GFSK</u>	Middle	-1.16	0.77	-0.90	0.81
	Highest	-2.38	0.58	-2.03	0.63
	Lowest	-3.63	0.43	-2.05	0.62
<u>π/4DQPSK</u>	Middle	-3.68	0.43	-1.54	0.70
	Highest	-4.68	0.34	-2.34	0.58
<u>8DPSK</u>	Lowest	-3.54	0.44	-1.51	0.71
	Middle	-3.68	0.43	-0.87	0.82
	Highest	-4.74	0.34	-1.95	0.64

Note 1: The average output power was tested using an average power meter for reference only. Note 2: See next pages for actual measured spectrum plots.



Lowest Channel & Modulation : GFSK



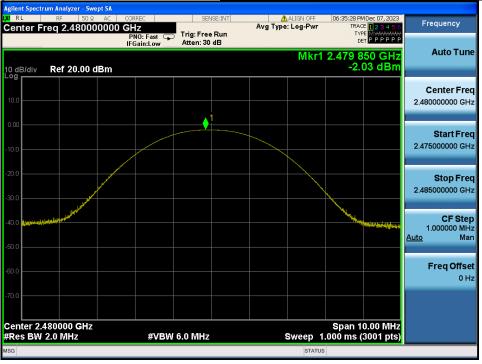
#### **Peak Output Power**

Middle Channel & Modulation : GFSK









#### **Peak Output Power**

#### Lowest Channel & Modulation : π/4DQPSK



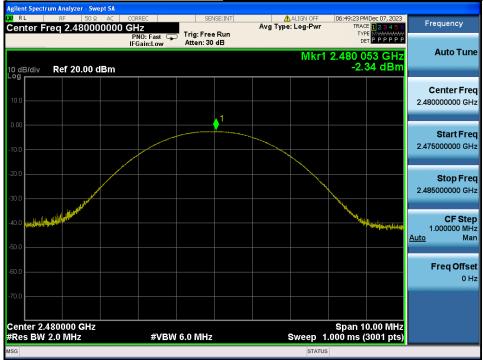


Middle Channel & Modulation : π/4DQPSK



#### **Peak Output Power**

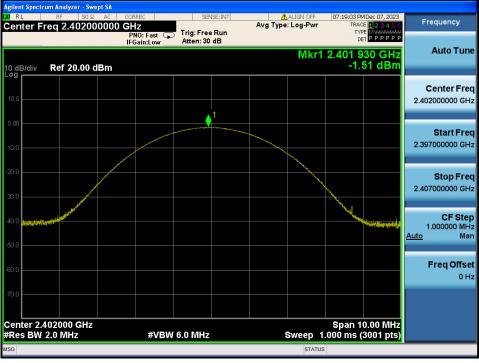
### Highest Channel & Modulation : π/4DQPSK

















# Highest Channel & Modulation : 8DPSK

KI RL	um Analyzer - Swe RF 50 Ω req 2.48000	AC COR 0000 GH			NSE:INT	ALIGN OFF	TRA T\	MDec 07, 2023 CE <b>1 2 3 4 5 6</b> PE M <del>WWWWW</del>	Frequency
0 dB/div	Ref 20.00 d	IFG	ain:Low	Atten: 30		Mkr	1 2.480 (	010 GHz 95 dBm	Auto Tune
. <b>og</b> 10.0					1				Center Fred 2.480000000 GH:
10.0									Start Free 2.475000000 GH:
20.0									<b>Stop Fre</b> 2.485000000 GH
10.0 <b>juha wali</b> a 50.0 <b></b>	Adudd address of						- Wee	n na	<b>CF Stej</b> 1.000000 MH <u>Auto</u> Ma
60.0									Freq Offse 0 H
20.0 Center 2.4 Res BW	180000 GHz 2 0 MHz		#VBW	6.0 MHz		Sween	Span 1	10.00 MHz (3001 pts)	
SG			<i></i>			STATU		(over proj	

# 5. 20 dB Bandwidth

### 5.1. Test Setup

Refer to the APPENDIX I.

### 5.2. Limit

Limit : Not Applicable

### 5.3. Test Procedure

- 1. The 20 dB bandwidth was measured with a spectrum analyzer connected to RF antenna Connector (conducted measurement) while EUT was operating in transmit mode. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer.
- 2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using below setting:

RBW = 1 % to 5 % of the 20 dB BW

 $VBW \ge 3 \times RBW$ 

Span = between two times and five times the 20 dB bandwidth

Sweep = auto

Detector function = peak

Trace = max hold

#### 5.4. Test Results

Modulation	Tested Channel	20 dB BW (MHz)
	Lowest	1.015
<u>GFSK</u>	Middle	1.015
	Highest	1.016
	Lowest	1.344
<u>π/4DQPSK</u>	Middle	1.345
	Highest	1.349
	Lowest	1.346
<u>8DPSK</u>	Middle	1.347
	Highest	1.344

Lowest Channel & Modulation : GFSK



#### 20 dB BW

### Middle Channel & Modulation : GFSK



# Highest Channel & Modulation : GFSK

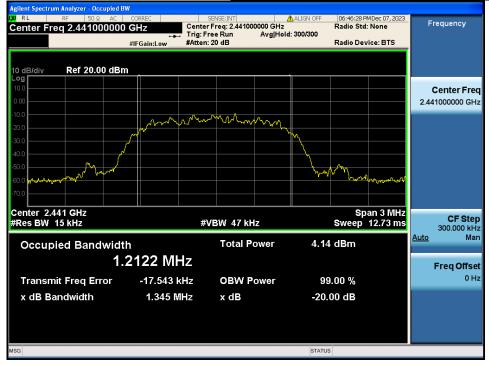


#### 20 dB BW

#### Lowest Channel & Modulation : π/4DQPSK



# Middle Channel & Modulation : π/4DQPSK

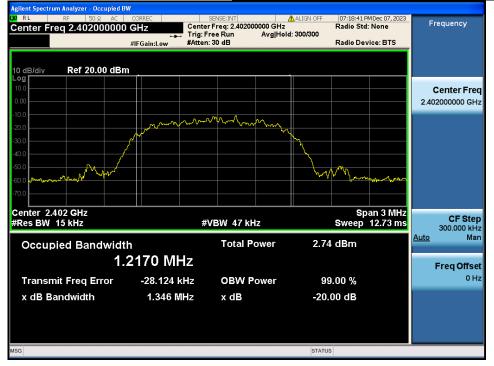


#### 20 dB BW

### Highest Channel & Modulation : π/4DQPSK



# Lowest Channel & Modulation : 8DPSK

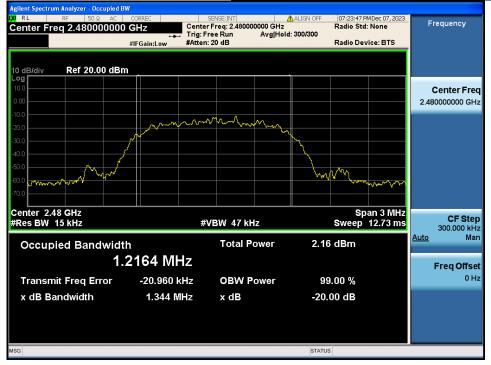


#### 20 dB BW

#### Middle Channel & Modulation : 8DPSK



# Highest Channel & Modulation : 8DPSK





# 6. Carrier Frequency Separation

# 6.1. Test Setup

Refer to the APPENDIX I.

# 6.2. Limit

Limit : ≥ 25 kHz or ≥ Two-Thirds of the 20 dB BW whichever is greater.

# 6.3. Test Procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the markerdelta function was recorded as the measurement results.

The spectrum analyzer is set to :

Span = wide enough to capture the peaks of two adjacent channels

RBW = Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel.

VBW ≥ RBW Sweep = auto

Detector function = peak Trace = max hold

# 6.4. Test Results

#### FH mode

Hopping Mode	Modulation	Peak of reference channel(MHz)	Peak of adjacent Channel(MHz)	Test Result (MHz)
	GFSK	2 440.979	2 441.981	1.002
Enable	π/4DQPSK	2 440.979	2 441.984	1.005
	8DPSK	2 440.985	2 441.987	1.002

#### AFH mode

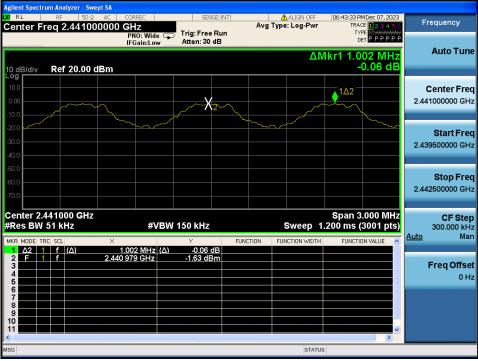
Hopping Mode	Modulation	Peak of reference channel(MHz)	Peak of adjacent Channel(MHz)	Test Result (MHz)
	GFSK	2 440.985	2 441.981	0.996
Enable	π/4DQPSK	2 439.981	2 440.983	1.002
	8DPSK	2 440.988	2 441.978	0.990

Note 1 : See next pages for actual measured spectrum



# Carrier Frequency Separation (FH)





#### **Carrier Frequency Separation (FH)**

#### Hopping mode : Enable&π/4DQPSK





# Carrier Frequency Separation (FH)

Hopping mode : Enable&8DPSK

Agilent Spectrum Analyzer - Swept SA					
M RL RF 50 Ω AC Center Freq 2.441000000	) GHz		ALIGN OFF	07:34:19 PMDec 07, 202 TRACE 1 2 3 4 5	Frequency
10 dB/div Ref 20.00 dBm	PNO: Wide Trig: Fro IFGain:Low Atten: 3		ΔM	түре Милин рет Р Р Р Р Р kr1 1.002 МН -0.06 dl	Auto Tune
Log 10.0 0.00 -10.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	X2		<u>1Δ2</u>	Center Freq 2.441000000 GHz
-20.0					Start Freq 2.439500000 GHz
-50.0 -60.0 -70.0					<b>Stop Freq</b> 2.442500000 GHz
Center 2.441000 GHz #Res BW 51 kHz	#VBW 150 kH	Z	Sweep 1.2	Span 3.000 MH 200 ms (3001 pts FUNCTION VALUE	
3 4 5 6 7 8	1.002 MHz (∆) -0.00 10 985 GHz -4.67 (	6 dB dBm			Freq Offset 0 Hz
9 10 11 KI MSG	lu -		STATUS		×



# Carrier Frequency Separation (AFH) <u>Hopping mode : Enable&GFSK</u>



#### Carrier Frequency Separation (AFH) <u>Hopping mode : Enable&π/4DQPSK</u>

	um Analyzer - Swe						
enter F	RF 50 Ω req 2.44100			e Run	ALIGN OFF	08:14:22 PMDec 07, 2023 TRACE 1 2 3 4 5 ( TYPE MWWWWW	
10 dB/div	Ref 20.00 d	IFGain:L		) dB	Δι	/kr1 1.002 MHz -0.04 dB	
- <b>og</b> 10.0 0.00	X2	^		1Δ2	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		<b>Center Fre</b> 2.441000000 GH
20.0 30.0 40.0							<b>Start Fre</b> 2.439500000 GH
50.0 60.0 70.0							<b>Stop Fre</b> 2.442500000 GH
enter 2. Res BW	441000 GHz 51 kHz	#	≠VBW 150 kHz		Sweep 1	Span 3.000 MHz .200 ms (3001 pts)	300.000 kH
KR         MODE         TR           1         Δ2         1           2         F         1           3         -         1           4         -         -           5         -         -	f (Δ)	× 1.002 MH 2.439 981 GH	Y Iz (∆) -0.04 z -4.69 c		ION FUNCTION WIDTH	FUNCTION VALUE	Auto Ma FreqOffse 0 H
6 7 8 9 0							
			ш		STATU		



# Carrier Frequency Separation (AFH) <u>Hopping mode : Enable&8DPSK</u>

Agilent Spectr											
Center F	RF req 2.			ORREC		VSE:INT	Avg 1	ALIGN OFF	TRA	MDec 07, 2023 CE 123456	Frequency
				PNO: Wide FGain:Low					D		Auto Tune
10 dB/div	Ref	20.00 d	IBm							990 kHz 0.00 dB	Auto Tulle
Log 10.0 0.00	,	~~~~	<u> </u>		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	( <u>2</u> ~			1Δ2		Center Freq 2.441000000 GHz
-20.0 -30.0 -40.0											<b>Start Freq</b> 2.439500000 GHz
-50.0 -60.0 -70.0											<b>Stop Freq</b> 2.442500000 GHz
Center 2. #Res BW	51 kH			#VI	BW 150 kHz				1.200 ms (		CF Step 300.000 kHz Auto Man
MKR MODE TI		Δ)	X	990 kHz (	γ (Δ) 0.00		NCTION	FUNCTION WIDTH	FUNCTI	DN VALUE	- tarto
2 F 1 3 4 5				88 GHz	-4.77 d						<b>Freq Offset</b> 0 Hz
6 7 8 9 10											
11					111					×	
MSG								STATU	JS		

# 7. Number of Hopping Channels

# 7.1. Test Setup

Refer to the APPENDIX I.

# 7.2. Limit

Limit : >= 15 hops

# 7.3. Test Procedure

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

To get higher resolution, two frequency ranges for FH mode within the 2 400 MHz ~ 2 483.5 MHz were examined.

The spectrum analyzer is set to :

Span for FH mode = 50 MHz	Start Frequency = 2 391.5 MHz,	Stop Frequency = 2 441.5 MHz				
	Start Frequency = 2 441.5 MHz,	Stop Frequency = 2 491.5 MHz				
Span for AFH mode = 30 MHz	Start Frequency = 2 426.0 MHz,	Stop Frequency = 2 456.0 MHz				
	-	ss than 30 % of the channel spacing				
or the 20 dB bandwidth, v	whichever is smaller.					
VBW ≥ RBW	Sweep = auto	Sweep = auto				
Detector function = peak	Trace = max hold					

# 7.4. Test Results

#### FH mode

Hopping mode	Modulation	Test Result (Total Hops)
	GFSK	79
Enable	π/4DQPSK	79
	8DPSK	79

#### AFH mode

Hopping mode	Modulation	Test Result (Total Hops)					
	GFSK	20					
Enable	π/4DQPSK	20					
	8DPSK	20					

Note 1 : See next pages for actual measured spectrum plots.



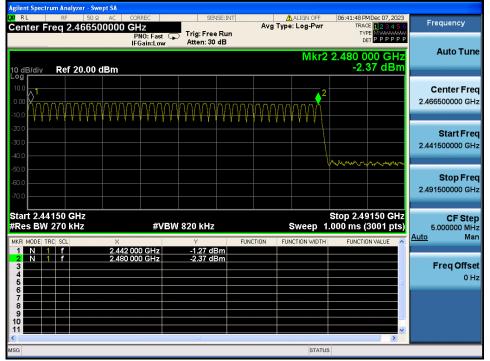
# Number of Hopping Channels 1(FH)

Hopping mode : Enable & GFSK

Agilent Spectr										
LXI RL		50 Ω AC	CORREC	SEN:	6E:INT		ALIGN OFF		MDec 07, 2023	Frequency
Center F	req 2.41	6500000			_	Avg Type	e: Log-Pwr	TRA	<sup>CE</sup> 123456	riequency
			PNO: Fast	Trig: Free Atten: 30				IY D	PE MWWWWW ET P P P P P P	
			IFGain:Low	Atten: 30	40					Auto Tuno
							Mkr2	2.441 0	00 GHz	Auto Tune
	Dof 20	00 dBm						-1	15 dBm	
10 dB/div Log	Ref 20.	ий авт							io abiii	
10.0										
10.0		1							2	Center Freq
0.00		<u> </u>				00000		00000		2.416500000 GHz
-10.0			W W W W W W	`\V.V.V.V.V	N V V V V	1 V V V V	W V V V V	W V V V V	1 V V V V V	
- 10.0		I I I	<u> </u>		YYYY	* * * * * *	****	¥ ¥ ¥ ¥ ¥	Y Y Y Y Y	
-20.0										Otant Enga
										Start Freq
-30.0										2.391500000 GHz
-40.0										
-50.0 mm.m	whenter	worked								
-50.0										Stop Eron
-60.0										Stop Freq
70.0										2.441500000 GHz
-70.0										
Start 2.39									1150 GHz	CF Step
#Res BW	270 kHz		#VB\	N 820 kHz		1	Sweep 1	.000 ms (	3001 pts)	5.000000 MHz
										Auto Man
MKR MODE TR	RC SCL	×		Y		TION FUI	NCTION WIDTH	FUNCTI	DN VALUE	
1 N 1 2 N 1	f	2.40	2 000 GHz 1 000 GHz	<u>-1.73 dB</u> -1.15 dB						
3		2.44	T UUU GH2	-1.15 06	m					Freq Offset
4										
5										0 Hz
6										
7										
8					_					
9					_					
11									~	
<									>	
MSG							STATUS	5		

# Number of Hopping Channels 2(FH)

Hopping mode : Enable & GFSK





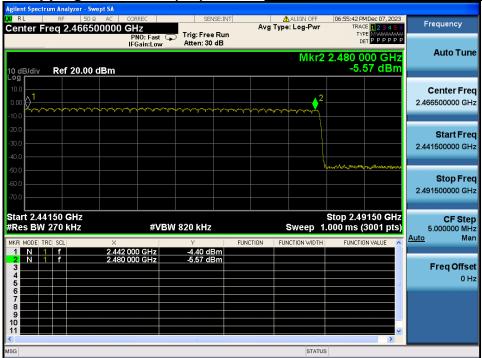
# Number of Hopping Channels 1(FH)

# Hopping mode : Enable&π/4DQPSK

Agilent Spe												
LXI RL	RF			CORREC		SENSE:INT			ALIGN OFF		MDec 07, 2023	Frequency
Center	Freq 2	2.41650	00000		Tria: P	ree Run		Avg Type	e: Log-Pwr	TRA	CE 123456 PE MWAAAAAAA	Trequency
				PNO: Fast IFGain:Low		30 dB				D	ETPPPPP	
				IFGain.LUW	Haten	00 48						Auto Tune
									Mkr2		00 GHz	Autorune
10 dB/div	Ret	20.00	dBm							-4.	60 dBm	
Log												
10.0												Center Freq
0.00			<u>1</u>								<u> </u>	2.416500000 GHz
			Xm	www	$\sim$	m m	m	- And Marker	***	- my- land-	marra	2.410300000 GHZ
-10.0												
-20.0			4									Otract Farmer
-30.0			[]									Start Freq
												2.391500000 GHz
-40.0												
-50.0	wasano a	للسبورسيتحدر										
-60.0												Stop Freq
-60.0												2.441500000 GHz
-70.0												2.441000000 0112
Start 2.											1150 GHz	CF Step
#Res B\	W 270	kHz		#VI	3W 820 k	Ηz			Sweep 1	.000 ms (	3001 pts)	5.000000 MHz
MKR MODE	TDC CCI	1	×		Y		FUNC		ICTION WIDTH	FUNCTI	ON VALUE	Auto Man
1 N	IRC SUL			000 GHz		dBm	FUNC	HUN FUR	ICTION WIDTH	FUNCTI	JN VALUE	
2 N	1 f		2.441	000 GHz	-4.60	dBm						
3												Freq Offset
4												0 Hz
5												
7												
8												
9												
11											~	
<					Ш						>	
MSG			_						STATU	s		
mod									STATU			

# Number of Hopping Channels 2(FH)

# Hopping mode : Enable &π/4DQPSK





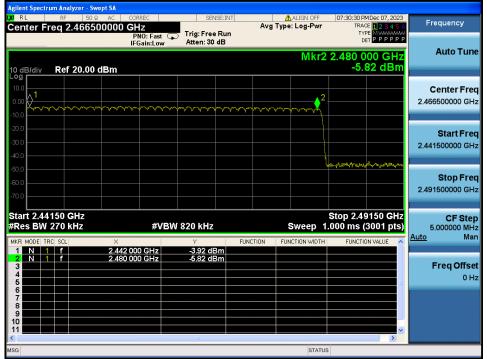
# Number of Hopping Channels 1(FH)

Hopping mode : Enable&8DPSK

Agilent Spectrum Analyzer - Swept SA					
LX/RL RF 50Ω AC	CORREC	SENSE:INT	ALIGN OFF	07:29:17 PMDec 07, 2023	Frequency
Center Freq 2.41650000	0 GHz	Trig: Free Run	Avg Type: Log-Pwr	TRACE 123456 TYPE MINIMUM	requercy
	PNO: Fast 😱 IFGain:Low	Atten: 30 dB		DET PPPPP	
	IFGain:Low	Auten. ov dD			Auto Tune
			Mkr2	2.441 000 GHz	Autorune
10 dB/div Ref 20.00 dBm				-4.13 dBm	
Log					
10.0					Center Freq
0.00				2	2.416500000 GHz
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	᠂ᠰ᠕᠕᠕᠆ᠰ᠆ᠰ᠆ᠰ	www.www.www.w		2.410500000 GH2
-10.0					
-20.0					
					Start Freq
-30.0					2.391500000 GHz
-40.0					
-50.0 mountainen hand					
-50.0					Stop Freq
-60.0					
-70.0					2.441500000 GHz
10.0					
Start 2.39150 GHz				Stop 2.44150 GHz	0.5.04
#Res BW 270 kHz	#\/D\//	820 kHz		.000 ms (3001 pts)	CF Step
#Res BW 210 KH2	# V D V V		Sweep I	.000 ms (300 r pts)	5.00000 MHz
MKR MODE TRC SCL X			CTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
1 N 1 f 2.4	402 000 GHz	-4.31 dBm			
	141 000 GHz	-4.13 dBm			Freq Offset
3 4					
5				3	0 Hz
6					
7					
8					
9 10					
11				~	
<		111		>	
MSG			STATUS	3	
			UNITO		

# Number of Hopping Channels 2(FH)

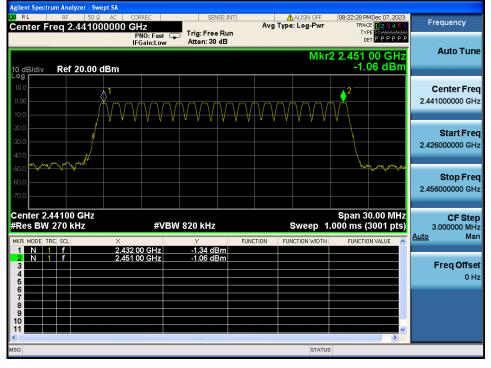
#### Hopping mode : Enable & 8DPSK





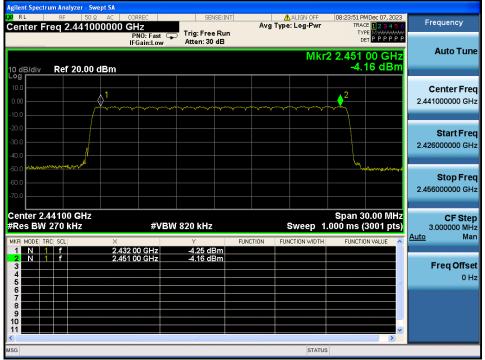
# Number of Hopping Channels 1(AFH)

Hopping mode : Enable & GFSK



# Number of Hopping Channels 1(AFH)

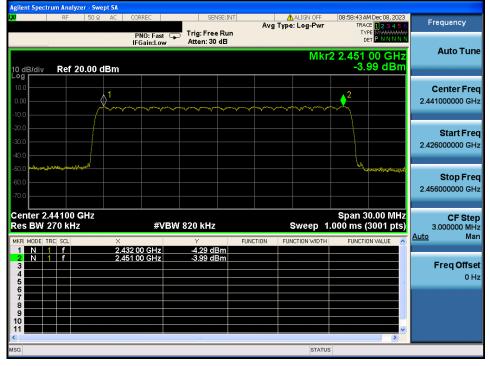
### Hopping mode : Enable &π/4DQPSK





# Number of Hopping Channels 1(AFH)

# Hopping mode : Enable & 8DPSK





# 8. Time of Occupancy

# 8.1. Test Setup

Refer to the APPENDIX I.

# 8.2. Limit

The maximum permissible time of occupancy is 400 ms within a period of 400 ms multiplied by the number of hopping channels employed.

# 8.3. Test Procedure

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to :

Center frequency = 2 441 MHz

Span = zero

RBW = 1 MHz (RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel)

VBW ≥ RBW

Detector function = peak

Trace = max hold

# 8.4. Test Results

#### FH mode

Hopping mode	Packet Type	Number of hopping Channels	Burst On Time (ms)	Period (ms)	Test Result (sec)
Enable	DH 5	79	2.880	3.750	0.307
	2 DH 5	79	2.880	3.750	0.307
	3 DH 5	79	2.880	3.750	0.307

AFH mode

Hopping mode	Packet Type	Number of hopping Channels	Burst On Time (ms)	Period (ms)	Test Result (sec)
	DH 5	20	2.880	3.750	0.154
Enable	2 DH 5	20	2.880	3.750	0.154
	3 DH 5	20	2.880	3.750	0.154

Note 1 : Dwell Time = 0.4 × Hopping channel × Burst ON time ×

((Hopping rate ÷ Time slots) ÷ Hopping channel)

- Time slots for DH5 = 6 slots (TX = 5 slots / RX = 1 slot)

- Hopping Rate = 1 600 for FH mode & 800 for AFH mode

Note 2 : See next pages for actual measured spectrum plots.

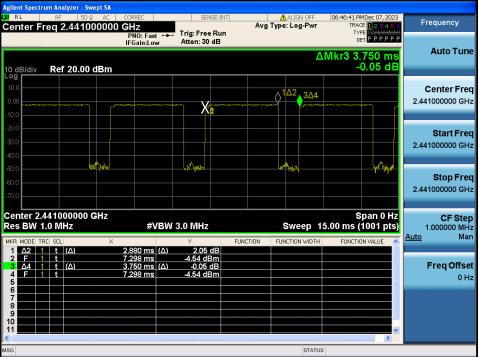


# Time of Occupancy (FH)

Agilent Spectrum Analyzer - Swept SA	
	ALIGN OFF 06:32:46 PM Dec 07, 2023 g Type: Log-Pwr TRACE 12 3:45 6 Type Water 12 3:45 6
PN0: Fast ++ Trig: Free Run IFGain:Low Atten: 30 dB	ΔMkr3 3.750 ms
10 dB/div Ref 20.00 dBm	0.03 dB
49.9	1Δ2 3Δ4 Center Freq
10.00 Xa	2.441000000 GHz
-20.0	Start Freq
-30.0	2.441000000 GHz
-40.0 -50.0	Pelus status
-60.0	Stop Freq
-70.0	2.44100000 GHz
Center 2.441000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz	Span 0 Hz CF Step Sweep 15.00 ms (1001 pts) 1.000000 MHz
MKR         MODE         TRC         SCL         X         Y         FUNCTION           1         Δ2         1         t         (Δ)         2.880 ms         (Δ)         0.19 dB	FUNCTION WIDTH FUNCTION VALUE
2         F         1         t         6.548 ms         -1.28 dBm           3         Δ4         1         t         (Δ)         3.750 ms         (Δ)         0.03 dB           4         F         1         t         6.548 ms         -1.28 dBm           5         -         -         1.28 dBm         -	Freq Offset
MSG	STATUS

#### Time of Occupancy (FH)





# Hopping mode : Enable&DH5



#### Time of Occupancy (FH)

Hopping mode : Enable&3-DH5

	rum Analyzer - Swept S/	l				
LXI RL	RF 50Ω AC		SENSE:INT	\Lambda ALIGN OFF	07:21:27 PMDec 07, 2023	Frequency
Center F	reg 2.4410000	00 GHz		Avg Type: Log-Pwr	TRACE 123456	Frequency
		PNO: Fast 🔸	Trig: Free Run			
		IFGain:Low	Atten: 30 dB		Der	
				Δ	Mkr3 3.750 ms	Auto Tune
	B-600.00 JB-				0.06 dB	
10 dB/div Log	Ref 20.00 dBn	1			0.00 ab	
10.0						Center Freq
0.00	a na halaf kana na halamana kalan	Amore Information of the Amore and Amore			huith different a different	2.441000000 GHz
40.0			Xa			
-10.0						
-20.0						Otort From
-30.0						Start Freq
-30.0						2.441000000 GHz
-40.0	<b>.</b>					
-50.0			when	of Ulive	at march	
-50.0			-n -l -N	11 -0004	fla. Afreis	Stop Freq
-60.0						
-70.0						2.441000000 GHz
-70.0						
	441000000 GHz				Span 0 Hz	CF Step
Res BW 1	1.0 MHz	#VBW	3.0 MHz	Sweep 1	5.00 ms (1001 pts)	1.000000 MHz
					FUNCTION VALUE	Auto Man
MKR MODE T		×		JNCTION FUNCTION WIDTH	FUNCTION VALUE	
1 <u>Δ2</u> <sup>2</sup> 2 F <sup>2</sup>	1 t (Δ)	2.880 ms (∆) 7.433 ms	1.60 dB -4.06 dBm			
<b>3</b> Δ4 ′	1 t (Δ)	3.750 ms (Δ)	0.06 dB			Freq Offset
4	1 t	7.433 ms	-4.06 dBm			
5					8	0 Hz
6						
7						
8						
9						
11					~	
<					>	
					,	
MSG				STATUS	8	

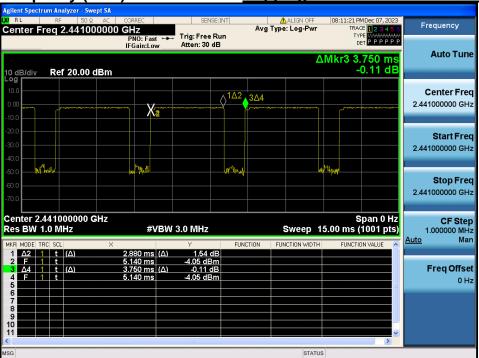


#### Time of Occupancy (AFH)

Hopping mode : Enable&DH5

Agilent Spectrum Analyzer - Swept SA				
RE RF 50 Ω AC     Center Freq 2.441000000	CORREC SENSE:IN	ALIGN OFF	08:07:57 PMDec 07, 2023 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast +++ Trig: Free Ru IFGain:Low #Atten: 30 dB	n	TYPE WWWWW DET P P P P P P	Auto Tune
10 dB/div Ref 20.00 dBm			0.02 dB	
10.0	Xa	1Δ2,3Δ4		Center Freq 2.441000000 GHz
-20.0				<b>Start Freq</b> 2.441000000 GHz
-50.0 WYW -60.0	W <sup>Ch</sup> kovi			<b>Stop Freq</b> 2.441000000 GHz
Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	-	Span 0 Hz 5.00 ms (1001 pts)	CF Step 1.000000 MHz Auto Man
MKR         MODE         TRC         SCL         X           1         Δ2         1         t         (Δ)           2         F         1         t           3         Δ4         1         t         (Δ)           4         F         1         t         5           6	2.880 ms         (Δ)         0.20 dB           6.698 ms         -1.19 dBm           3.750 ms         (Δ)         0.02 dB           6.698 ms         -1.19 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
7 8 9 10 11			×	
MSG		STATU	S	

### Time of Occupancy (AFH) <u>Hopping mode : Enable&2-DH5</u>





#### Time of Occupancy (AFH)

Hopping mode : Enable&3-DH5

	trum Analyzer - Swe								
LXI RL			REC	SENSE:		ALIGN OFF	08:14:43 PMDec		Frequency
Center F	req 2.44100	00000 GH	Z	Trig: Free Ru	Avg	Type: Log-Pwr			riequency
			NO: Fast ↔ Gain:Low	Atten: 30 dB			DET P	PPPPP	
	-	110	Janneow				MI-0 0 70	<b>A</b>	Auto Tune
						4	1Mkr3 3.75	u ms	
10 dB/div	Ref 20.00 (	dBm					-0.0	7 dB	
Log									
10.0				∆1∆2 <u>3</u> ,	Λ <i>4</i>				Center Freq
0.00		Viruseau	****		 	anal-state states	د الم	•••	2.441000000 GHz
-10.0		Xa							
-20.0									Start Freq
-30.0									2.441000000 GHz
-40.0									2.441000000 0112
		Alla		10th dwal		Bear		1 mus	
-50.0		al sado		1.4 14 1		A 1.044		1.10	Stop Freq
-60.0									
-70.0									2.441000000 GHz
Center 2	.441000000 0	Hz					Spar	ו 0 Hz	CF Step
Res BW	1.0 MHz		#VBW	3.0 MHz		Sweep 1	5.00 ms (100	1 pts)	1.000000 MHz
									Auto Man
MKR MODE 1		×	80 ms (Δ)	۲ 1.46 dB	FUNCTION	FUNCTION WIDTH	FUNCTION VA	LUE	
1 <u>A2</u> 2 F	1 t (Δ)		<u>80 ms (Д)</u> 61 ms	-4.07 dBm					
<b>3</b> ∆4	1 t (Δ)	3.7	50 ms (Δ)	-0.07 dB					Freq Offset
4 F	1 t	3.7	61 ms	-4.07 dBm					0 Hz
5								=	
7									
8									
9									
11								~	
<				ш				>	
MSG						STATU	s		

# 9. Unwanted Emissions

#### 9.1. Test Setup

Refer to the APPENDIX I.

#### 9.2. Limit

#### Part 15.247(d), Part 15.205, Part 15.209

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of Part 15.247 the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.205(c)).

#### - Part 15.209: General requirement

Frequency (MHz)	FCC Limit (uV/m)	Measurement Distance (m)
0.009 - 0.490	2 400 / F (kHz)	300
0.490 - 1.705	24 000 / F (kHz)	30
1.705 - 30.0	30	30

Frequency (MHz)	FCC Limit (uV/m)	Measurement Distance (m)
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §15.231 and 15.241.



MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.414 25 ~ 8.414 75	108 ~ 121.94	1 300 ~ 1 427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1 435 ~ 1 626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.173 5 ~ 2.190 5	12.519 75 ~ 12.520 25	149.9 ~ 150.05	1 645.5 ~ 1 646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.576 75 ~ 12.577 25	156.524 75 ~ 156.525 25	1 660 ~ 1 710	8.025 ~ 8.5	22.01 ~ 23.12
4.177 25 ~ 4.177 75	13.36 ~ 13.41	156.7 ~ 156.9	1 718.8 ~ 1 722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.207 25 ~ 4.207 75	16.42 ~ 16.423	162.012 5 ~ 167.17	2 200 ~ 2 300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.694 75 ~ 16.695 25	167.72 ~ 173.2	2 310 ~ 2 390	10.6 ~ 12.7	36.43 ~ 36.5
6.267 75 ~ 6.268 25	16.804 25 ~ 16.804 75	240 ~ 285	2 483.5 ~ 2 500	13.25 ~ 13.4	Above 38.6
6.311 75 ~ 6.312 25	25.5 ~ 25.67	322 ~ 335.4	2 655 ~ 2 900		
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3 260 ~ 3 267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3 332 ~ 3 339		
8.376 25 ~ 8.386 75	74.8 ~ 75.2	960 ~ 1 240	3 345.8 ~ 3 358		
			3 600 ~ 4 400		

#### 9.3. Test Procedures

#### 9.3.1. Test Procedures for Unwanted Emissions(Radiated)

- The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 1 or 3 meter away from the interference-receiving antenna.
- For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.
- 4. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 7. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

#### **Measurement Instrument Setting**

- Frequencies less than or equal to 1 000 MHz The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasipeak detection (QP) at frequency below 1 GHz.
- Frequencies above 1 000 MHz
   The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
   The result of Average measurement is calculated using PK result and duty correction factor.



# **Dt&C**

#### 9.3.2. Test Procedures for Unwanted Emissions(Conducted)

- 1. The transmitter output was connected to the spectrum analyzer.
- 2. The **reference level** of the fundamental frequency was measured with the spectrum analyzer using RBW = 100 kHz, VBW = 300 kHz.
- 3. The conducted spurious emission was tested each ranges were set as below.

Frequency range : 9 kHz ~ 30 MHz RBW = 100 kHz, VBW = 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40 001

Frequency range : 30 MHz ~ 10 GHz, 10 GHz ~ 25 GHz RBW = 1 MHz, VBW = 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40 001

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)

If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2 001 to get accurate emission level within 100 kHz BW.

Also the path loss for conducted measurement setup was used as described on the Appendix I of this test report.

#### 9.4. Test Results

#### 9.4.1. Unwanted Emissions(Radiated)

#### Test Notes.

1. The radiated emissions were investigated 9 kHz to 25 GHz. And no other spurious and harmonic emissions were found below listed frequencies.

2. Information of Distance Correction Factor

For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.

In this case, the distance correction factor is applied to the result.

- Calculation of distance factor

At frequencies below 30 MHz = 40 log(tested distance / specified distance)

At frequencies at or above 30 MHz = 20 log(tested distance / specified distance)

When distance factor is "N/A", the measurements were performed at the specified distance and distance factor is not applied. 3. DCCF Calculation. (DCCF = Duty Cycle Correction Factor)

- Time to cycle through all channels =  $\Delta t$  = T [ms] X 20 minimum hopping channels , where T = pulse width = 2.88 ms

- 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.88 X 20) = 1.74 = 2

- The Worst Case Dwell Time = T [ms] x H' = 2.88 ms X 2 = 5.76 ms

- DCCF = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log( 5.76 / 100 ) = -24.79 dB

4. Sample Calculation.

Margin = Limit - Result / Result = Reading + TF+ DCCF + DCF / TF = AF + CL + HL + AL - AG

Where, TF = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, HL = High pass filter Loss,

AL = Attenuator Loss, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

#### 9 kHz ~ 25 GHz Data (Modulation : GFSK)

#### Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 388.91	V	Х	PK	49.67	4.47	N/A	N/A	54.14	74.00	19.86
2 388.91	V	Х	AV	49.67	4.47	-24.79	N/A	29.35	54.00	24.65
4 805.23	V	Х	PK	50.36	1.64	N/A	N/A	52.00	74.00	22.00
4 805.23	V	Х	AV	50.36	1.64	-24.79	N/A	27.21	54.00	26.79

#### Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 882.26	V	Х	PK	50.70	1.90	N/A	N/A	52.60	74.00	21.40
4 882.26	V	Х	AV	50.70	1.90	-24.79	N/A	27.81	54.00	26.19

Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.93	V	Х	PK	52.61	4.98	N/A	N/A	57.59	74.00	16.41
2 483.93	V	Х	AV	52.61	4.98	-24.79	N/A	32.80	54.00	21.20
4 960.12	V	Х	PK	50.29	2.52	N/A	N/A	52.81	74.00	21.19
4 960.12	V	Х	AV	50.29	2.52	-24.79	N/A	28.02	54.00	25.98



#### 9 kHz ~ 25 GHz Data (Modulation : $\pi$ /4DQPSK)

Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 386.91	V	Х	PK	50.82	4.46	N/A	N/A	55.28	74.00	18.72
2 386.91	V	Х	AV	50.82	4.46	-24.79	N/A	30.49	54.00	23.51
4 803.94	V	Х	PK	51.33	1.64	N/A	N/A	52.97	74.00	21.03
4 803.94	V	Х	AV	51.33	1.64	-24.79	N/A	28.18	54.00	25.82

#### Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 882.17	V	Х	PK	50.23	1.90	N/A	N/A	52.13	74.00	21.87
4 882.17	V	Х	AV	50.23	1.90	-24.79	N/A	27.34	54.00	26.66

#### Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 485.19	V	Х	PK	52.28	5.01	N/A	N/A	57.29	74.00	16.71
2 485.19	V	Х	AV	52.28	5.01	-24.79	N/A	32.50	54.00	21.50
4 959.68	V	Х	PK	50.52	2.52	N/A	N/A	53.04	74.00	20.96
4 959.68	V	Х	AV	50.52	2.52	-24.79	N/A	28.25	54.00	25.75

#### 9 kHz ~ 25 GHz Data (Modulation : <u>8DPSK</u>)

#### Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 389.62	V	Х	PK	50.62	4.48	N/A	N/A	55.10	74.00	18.90
2 389.62	V	Х	AV	50.62	4.48	-24.79	N/A	30.31	54.00	23.69
4 803.55	V	Х	PK	51.40	1.64	N/A	N/A	53.04	74.00	20.96
4 803.55	V	Х	AV	51.40	1.64	-24.79	N/A	28.25	54.00	25.75

#### Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 881.47	V	Х	PK	50.39	1.87	N/A	N/A	52.26	74.00	21.74
4 881.47	V	Х	AV	50.39	1.87	-24.79	N/A	27.47	54.00	26.53

#### Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 485.05	V	Х	PK	51.48	5.01	N/A	N/A	56.49	74.00	17.51
2 485.05	V	Х	AV	51.48	5.01	-24.79	N/A	31.70	54.00	22.30
4 959.82	V	Х	PK	49.41	2.52	N/A	N/A	51.93	74.00	22.07
4 959.82	V	Х	AV	49.41	2.52	-24.79	N/A	27.14	54.00	26.86



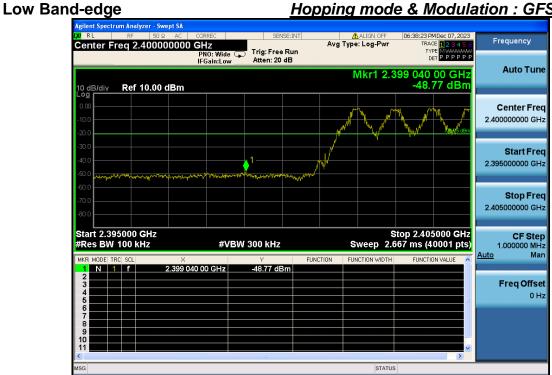
#### 9.4.2. Unwanted Emissions(Conducted)

#### Low Band-edge



#### Lowest Channel & Modulation : GFSK

#### Hopping mode & Modulation : GFSK

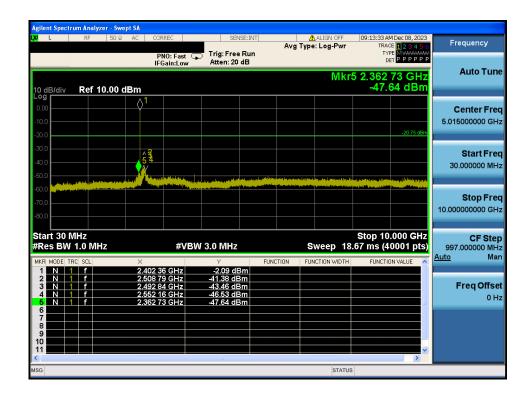




# Conducted Spurious Emissions

### Lowest Channel & Modulation : GFSK

Agilent Spectrum Analyzer - Swept SA				
	CORREC SENSE			Frequency
Center Freq 15.004500 MH		Avg Type: Log-Pv	Vr TRACE 123456	
10 dB/div Ref 10.00 dBm	PN0: Fast Trig: Free R IFGain:Low Atten: 20 dB		түре Милини рет Р Р Р Р Р Р Mkr1 281.9 kHz -45.00 dBm	Auto Tune
-10.0			-20.75 dBn	Center Freq 15.004500 MHz
				Start Freq
-40.0				9.000 kHz
When the second second second second second second	الفاحير ومندخاته ومحال المتحمية والمراجع	estiburistications, incorportions, all incorports	and we will be to a set of the se	Stop Freq
-80.0		and die Erfeit Man Balande in der Beiter Beiter Beiter die server die Volgen fenderen Beiter beiter Beiter beit	sette et de palaindeza y activitat de la pola y danse. Las de desiradades et	30.000000 MHz
Start 9 kHz #Res BW 100 kHz	#VBW 300 kHz	-	Stop 30.00 MHz 5.333 ms (40001 pts)	CF Step 2.999100 MHz Auto Man
MKR MODE TRC SCL X	Y 45.00 JB	FUNCTION FUNCTION WIE	TH FUNCTION VALUE	<u>Adto</u> Mari
	281.9 kHz -45.00 dBm			Freq Offset 0 Hz
6 7 8 9 10				
11			~	
<	Ш.		>	
MSG		ST/	TUS 1 DC Coupled	





# Conducted Spurious Emissions Lowest Channel & Modulation : GFSK

RL RF	50 Ω AC CORREC	SENSE:INT	ALIGN OFF	06:32:14 PM Dec 07, 2023 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast IFGain:Lov		Avg Type. Log-t wi		
0 dB/div Ref	10.00 dBm		Mkr3 1	4.062 375 GHz -45.80 dBm	Auto Tur
0.00 10.0 20.0				-20.75 dBm	Center Fre 17.500000000 GH
40.0 50.0				1	<b>Start Fre</b> 10.000000000 GH
60.0 70.0 60.0					<b>Stop Fre</b> 25.00000000 GH
Start 10.000 GH Res BW 1.0 M		BW 3.0 MHz	Sweep 40	Stop 25.000 GHz .00 ms (40001 pts)	CF Ste 1.50000000 GI <u>Auto</u> Mi
1 N 1 f 2 N 1 f 3 N 1 f 4 5	24.951 625 GHz 16.746 625 GHz 14.062 375 GHz	-39.77 dBm -43.69 dBm -45.80 dBm			Freq Offs 0 F
6 7 8 9 0					
11					



#### **Reference for limit**

#### Middle Channel & Modulation : GFSK



#### Conducted Spurious Emissions <u>Middle Channel & Modulation : GFSK</u>

